

5894

TWIN BEAM POWER TUBE

Useful at Frequencies up to 500 Mc

Unless Otherwise Specified, Values are on a Per-Tube Basis

GENERAL DATA

Electrical:

Heater for Unipotential Cathode:

Heater arrangement	*Series*	*Parallel*	
Voltage	12.6 ± 10%	6.3 ± 10%	ac or dc volts
Current	0.9	1.8	amp

Mu-Factor, Grid No.2 to Grid No.1 (Each Unit) for dc plate volts = 600, dc grid-No.2 volts = 250, and dc plate ma = 40	8.2	
Direct Interelectrode Capacitances (Each Unit):°		
Grid No.1 to plate.	0.8 max.	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater.	11	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater.	3.4	μμf

Mechanical:

Mounting Position:

Vertical	Base up or down
Horizontal	Plate terminals in horizontal plane
Maximum Overall Length	4-5/16"
Seated Length.	3-11/16" ± 3/16"
Maximum Diameter	1-15/16"
Bulb	T-14
Bulb Terminals (Two)	*See Dimensional Outline*
Weight (Approx.)	2.3 oz
Base	Small-Wafer Septar 7-Pin (JETEC No.E7-21)

BOTTOM VIEW

Pin 1 - Heater
Pin 2 - Grid No.1 of Unit No.2
Pin 3 - Grid No.2
Pin 4 - Cathode, Grid No.3, Internal Shield
Pin 5 - Heater Mid-Tap
Pin 6 - Grid No.1 of Unit No.1
Pin 7 - Heater
PU_1 - Plate of Unit No.1
PU_2 - Plate of Unit No.2

PLANE OF ELECTRODES OF EACH UNIT IS PARALLEL TO PLANE THROUGH AXIS OF TUBE AND AA'

Plate-Seal Temperature	200 max.	°C

° without external shield.

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Base-Seal Temperature	180 max.	°C

Cooling: Free circulation of air around the tube is required. In addition, some forced-air cooling will generally be required to prevent exceeding the specified maximum bulb temperature.

AF POWER AMPLIFIER & MODULATOR - Class B

Maximum CCS● Ratings, ***Absolute Values:***

DC PLATE VOLTAGE	600 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-175 max.	volts
MAX.-SIGNAL DC PLATE CURRENT*	200 max.	ma
MAX.-SIGNAL PLATE INPUT*	120 max.	watts
MAX.-SIGNAL GRID-No.2 INPUT*	7 max.	watts
PLATE DISSIPATION*	40 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical CCS● Operation:

DC Plate Voltage	450	600	volts
DC Grid-No.2 Voltage▲	250	250	volts
DC Grid-No.1 Voltage:			
From fixed-bias source	-23	-25	volts
Peak AF Grid-No.1-to-Grid-No.1 Voltage	53	53	volts
DC Plate Current:			
Zero-signal value	67	35	ma
Max.-signal value	200	168	ma
DC Grid-No.2 Current:			
Zero-signal value	8	4	ma
Max.-signal value	26	27	ma
DC Grid-No.1 Current:			
Max.-signal value	2.3	1.6	ma
Effective Load Resistance (Plate to plate)	4400	8000	ohms
Max.-Signal Driving Power (Approx.)♦	0.2	0.2	watt
Max.-Signal Power Output (Approx.)♦	60	70	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:▲		
With fixed bias	50000 max.	ohms
With cathode bias	Not recommended	

* Averaged over any audio-frequency cycle of sine-wave form.

▲ Preferably obtained from a separate source or from the plate-voltage supply with a voltage divider.

●, ♦: See next page.

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TWIN BEAM POWER TUBE

PLATE-MODULATED PUSH-PULL RF POWER AMPLIFIER - Class C Telephony

Carrier conditions per tube with a max. modulation factor of 1.0

Maximum CCS● Ratings, *Absolute Values*:

For max. plate voltage and max. plate input above 250 Mc, see Rating Chart I

DC PLATE VOLTAGE	450 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE	-175 max.	volts
DC PLATE CURRENT	160 max.	ma
DC GRID-No.1 CURRENT	10 max.	ma
PLATE INPUT	72 max.	watts
GRID-No.2 INPUT	4.5 max.	watts
PLATE DISSIPATION	27 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical CCS● Operation:

	Up to 250 Mc	*At 470 Mc*	
DC Plate Voltage	450	380	volts
DC Grid-No.2 Voltage (Approx.)♦	250	250	volts
From an adjustable series resistor having a max. value of	20000	30000	ohms
DC Grid-No.1 Voltage♠	-100	-60	volts
From a grid-No.1 resistor of	20000	15000	ohms
Peak RF Grid-No.1-to-Grid-No.1 Voltage	120	-	volts
DC Plate Current	150	160	ma
DC Grid-No.2 Current (Approx.)	16	8	ma
DC Grid-No.1 Current (Approx.)	5	4	ma

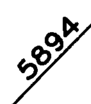
♥ Driver stage should be capable of supplying the specified driving power at low distortion to the No.1 grids of the class B stage. To minimize distortion, the effective resistance per grid-No.1 circuit of the class B stage should be held at a low value. For this purpose, the use of transformer coupling is recommended. In no case, however, should the total dc grid-No.1-circuit resistance exceed 50000 ohms.

♦ Obtained preferable from a separate source modulated along with the plate supply, or from the modulated plate supply through a series resistor. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

♠ Obtained from a grid-No.1 resistor of value shown or by partial self-bias method. A combination of grid-No.1 resistor and fixed supply has the advantage not only of protecting the tube from damage through loss of excitation but also of minimizing distortion by bias-supply compensation.

●: See next page.

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	Up to 250 Mc	*At 470 Mc*	
Driver Power Output (Approx.)	0.6	13	watts
Useful Power Output (Approx.)●●	50	35	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance‡.	50000 max.	ohms

PUSH-PULL RF POWER AMPLIFIER & OSCILLATOR - Class C Telegraphy□
and
PUSH-PULL RF POWER AMPLIFIER - Class C FM Telephony

Maximum CCS● Ratings, ***Absolute Values*****:**

For max. plate voltage and max. plate input above 250 Mc, see Rating Chart II

DC PLATE VOLTAGE	600 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE.	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE.	-175 max.	volts
DC PLATE CURRENT	220 max.	ma
DC GRID-No.1 CURRENT	10 max.	ma
PLATE INPUT.	120 max.	watts
GRID-No.2 INPUT.	7 max.	watts
PLATE DISSIPATION.	40 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode. .	100 max.	volts
Heater positive with respect to cathode. .	100 max.	volts

Typical CCS● Operation:

	Up to 250 Mc	*At 470 Mc*		
DC Plate Voltage	600	400	500	volts
DC Grid-No.2 Voltage (Approx.)● . . .	250	250	250	volts
From an adjustable series resistor having a max. value of.	33000	22000	47000	ohms
DC Grid-No.1 Voltage■. . . .	-80	-38	-60	volts
From a grid-No.1 resistor of.	39000	24000	30000	ohms
From cathode resistor of.	360	180	300	ohms
Peak RF Grid-No.1-to-Grid-No.1 Voltage.	200	-	-	volts
DC Plate Current	200	220	200	ma

□ Key-down conditions per tube without amplitude modulation. Amplitude modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.

●, ●●, ‡, ●, ■: see next page.



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	Up to 250 Mc	*At 470 Mc*		
DC Grid-No.2 Current (Approx.). . . .	16	12	8	ma
DC Grid-No.1 Current (Approx.). . . .	2	3	4	ma
Driver Power Output (Approx.)	4	5	13	watts
Useful Power Output (Approx.)●● . . .	85	43	55	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance‡. . . . . 50000 max. ohms

FREQUENCY TRIPLER - Class C

Maximum CCS● Ratings, *Absolute Values*:

For max. plate voltage and max. plate input above 250 Mc, see Rating Chart III

DC PLATE VOLTAGE	600 max.	volts
DC GRID-No.2 (SCREEN) VOLTAGE.	250 max.	volts
DC GRID-No.1 (CONTROL-GRID) VOLTAGE.	-175 max.	volts
DC PLATE CURRENT	160 max.	ma
DC GRID-No.1 CURRENT	10 max.	ma
PLATE INPUT.	80 max.	watts
GRID-No.2 INPUT.	7 max.	watts
PLATE DISSIPATION.	40 max.	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	100 max.	volts
Heater positive with respect to cathode	100 max.	volts

Typical CCS● Operation as Tripler:

	Up to 150 Mc		*To 225 Mc*	*To 462 Mc*		
DC Plate Voltage .	400	500	400	400	400	volts
DC Grid-No.2 Voltage (Approx.)● .	250	250	250	220	220	volts
From an adjustable series resistor having max. value of . . .	16000	39000	20000	56000	56000	ohms

● Continuous Commercial Service.

● Obtained preferably from a separate source, or from the plate-supply voltage with a voltage divider, or through a series resistor. A series grid-No.2 resistor should be used only when the 5894 is used in a circuit which is not keyed. It is recommended that this resistor be adjustable to permit obtaining the desired operating plate current after initial tuning adjustments are completed.

●●,‡,■: See next page.

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	Up to 150 Mc		*To 225 Mc*	*To 462 Mc*		
DC Grid-No.1 Voltage■	-150	-150	-150	-150	-175	volts
From a grid-No.1 resistor of. . .	30000	24000	50000	36000	36000	ohms
Peak RF Grid-No.1-to-Grid-No.1 Voltage.	360	360	360	-	-	volts
DC Plate Current . .	146	120	130	130	140	ma
DC Grid-No.2 Current (Approx.).	16	10	20	5	5	ma
DC Grid-No.1 Current (Approx.).	5	6	3	4	5	ma
Driver Power Output (Approx.).	0.9	1	0.5	4	8	watts
Useful Power Output (Approx.)●●. . . .	18	20	12	13	16	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance‡. . . . . 50000 max. ohms

CHARACTERISTICS RANGE VALUES FOR EQUIPMENT DESIGN

	Note	*Min.*	*Max.*	
Heater Current:				
Series connection	1	0.8	1	amp
Parallel connection	2	1.6	2	amp
Mu-Factor, Grid No.2 to Grid No.1 (Each Unit)	2,3	7	9.3	
Direct Interelectrode Capacitances (Each Unit):				
Grid No.1 to plate.	4	-	0.08	μμf
Grid No.1 to cathode & grid No.3 & internal shield, grid No.2, and heater.	4	9.4	11.6	μμf
Plate to cathode & grid No.3 & internal shield, grid No.2, and heater	4	2.6	3.7	μμf

Note 1: With 12.6 volts ac on heater.

Note 2: With 6.3 volts ac on heater.

Note 3: With dc plate voltage of 600 volts, dc grid-No.2 voltage of 250 volts, and dc plate current of 40 ma.

Note 4: Without external shield.

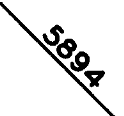
●● This value of useful power output is measured at load of output circuit.

‡ When grid No.1 is driven positive, the total dc grid-No.1-circuit resistance should not exceed the specified value of 50000 ohms. If this value is insufficient to provide adequate bias, the additional required bias must be supplied by a cathode resistor or fixed supply.

■ Obtained from a fixed supply, by grid-No.1 resistor, by cathode resistor, or by combination methods.

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OPERATING CONSIDERATIONS

Shielding of the 5894 in rf service is required for stable operation. A convenient method of shielding is to mount the socket approximately 7/8" beneath a hole in the chassis plate so that when the 5894 is inserted in the socket, the internal shield (see *Dimensional Outline*) of the tube will be close to the edge of the hole and in the same plane as the chassis plate. This arrangement provides an effective shield to isolate the grid-No.1 circuits from the plate circuits.

.080" ± .003" DIA.

SEE NOTE 2

5/8" ± 1/8"

.600" +.088" -.125"

3 11/16" ± 3/16"

4 5/16" MAX.

1 13/16" MAX.

SMALL-WAFER SEPTAR 7-PIN BASE JETEC Nº E7-21

INTERNAL SHIELD

7/8" ± 1/8"

1/8" APPROX.

1/2" ± 1/16"

7/16" ± 1/16"

5/16" MIN.

.000" MIN. (NOTE 3)

3/8" MAX.

.125" ± .003" DIA.

51° 51° 51° 51°

1" NOTE 1

1 15/16" MAX.

52° 52°

26° 26°

.058" +.002" -.006" DIA. 6-PINS

BOTTOM VIEW

92CM-8472

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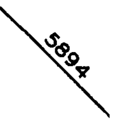
THE REFERENCE AXIS YY' IS DEFINED AS THE AXIS OF THE BASE-PIN GAUGE DESCRIBED IN NOTE 1.

NOTE 1: ANGULAR VARIATIONS BETWEEN PINS AND VARIATION IN PIN-CIRCLE DIAMETER ARE HELD TO TOLERANCES SUCH THAT PINS WILL ENTER TO A DISTANCE OF 3/8" A FLAT-PLATE BASE-PIN GAUGE HAVING SIX HOLES 0.0800" ± 0.0005" AND ONE HOLE 0.1450" ± 0.0005" ARRANGED ON A 1.0000" ± 0.0005" CIRCLE AT SPECIFIED ANGLES WITH TOLERANCE OF ± 5' FOR EACH ANGLE. GAUGE IS ALSO PROVIDED WITH A HOLE 0.500" ± 0.010" CONCENTRIC WITH PIN CIRCLE WHOSE CENTER IS ON THE AXIS YY'.

NOTE 2: THE PLATE LEADS WILL ENTER A FLAT-PLATE PLATE-LEAD GAUGE HAVING THICKNESS OF 3/8" AND HAVING TWO HOLES 0.1400" ± 0.0005" WHOSE CENTERS ARE LOCATED AT A DISTANCE OF 0.275" ± 0.001" FROM THE AXIS YY' AND WHOSE AXES ARE PARALLEL TO YY'. THE PLANE THROUGH THESE AXES WILL BE 90° ± 5' FROM THE PLANE THROUGH YY' AND PIN No.4.

NOTE 3: EXHAUST TIP WILL NOT EXTEND BEYOND THE PLANE WHICH PASSES THROUGH THE ENDS OF THE THREE LONGEST PINS.





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RATING CHART I
CLASS C TELEPHONY



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RATING CHART II
CLASS C TELEGRAPHY

NOV. 9, 1954

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92CM-8476



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RATING CHART III
CLASS C TRIPLER

VOLTAGE-CCS

INPUT-CCS

MAX. PLATE INPUT — WATTS: 20, 40, 60, 80, 100, 120

MAX. PLATE VOLTS: 100, 200, 300, 400, 500, 600

FREQUENCY—MC: 0, 100, 200, 300, 400, 500

NOV. 9, 1954

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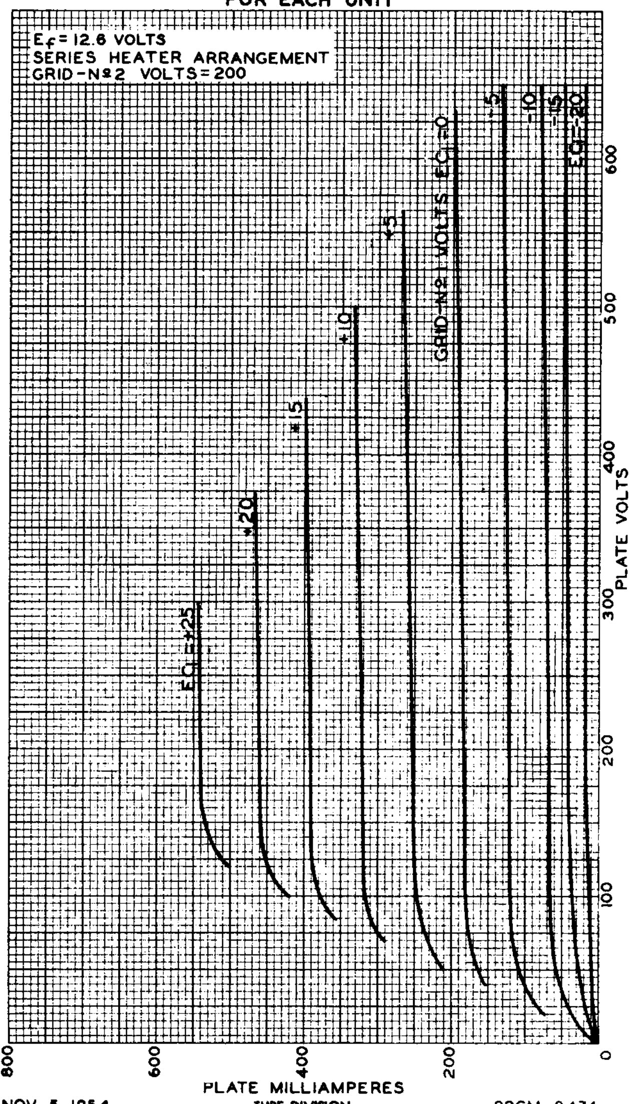
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AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



NOV. 5, 1954

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92CM-8474

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AVERAGE CHARACTERISTICS
FOR EACH UNIT

E_f = 12.6 VOLTS
SERIES HEATER ARRANGEMENT
GRID-No 2 VOLTS = 200
GRID-No 1 VOLTS = E_{C1}

GRID-No 2 MILLIAMPERES

300
200
100

EC1 = +25
+20
+15
+10
0
-10

0 100 200 300 400 500 600
PLATE VOLTS

E_f = 12.6 VOLTS
SERIES HEATER ARRANGEMENT
GRID-No 2 VOLTS = 200
GRID-No 1 VOLTS = E_{C1}

GRID-No 1 MILLIAMPERES

100
80
60
40
20

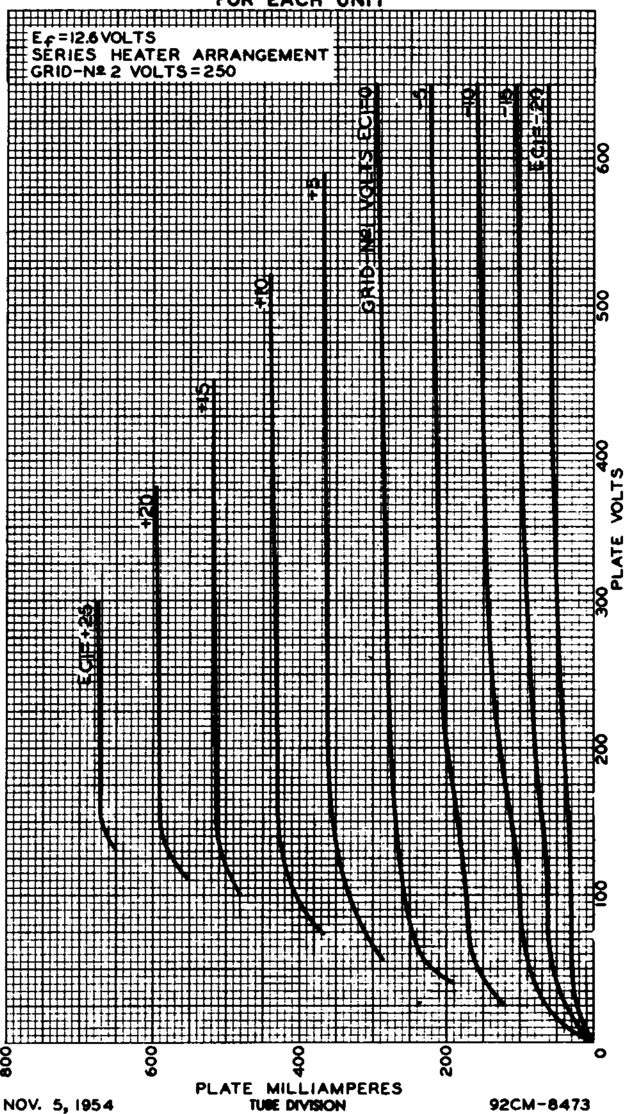
EC1 = +25
+20
+15
+10

0 100 200 300 400 500 600
PLATE VOLTS

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AVERAGE PLATE CHARACTERISTICS
FOR EACH UNIT



NOV. 5, 1954

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AVERAGE CHARACTERISTICS
FOR EACH UNIT

E_f = 12.6 VOLTS
SERIES HEATER ARRANGEMENT
GRID-No.2 VOLTS = 250
GRID-No.1 VOLTS = E_{C1}

E_f = 12.6 VOLTS
SERIES HEATER ARRANGEMENT
GRID-No.2 VOLTS = 250
GRID-No.1 VOLTS = E_{C1}